Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The first page of the marked-up version is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE."

Claim Rejections - 35 USC § 112

Claim 37

Claim 37 was rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 37 has been amended for clarification purposes only. Amended claim 37 recites, in part, "wherein said surface is raised to a temperature of at least about 1,000° Celsius."

Claim 36

Claim 36 was rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. (Office Action at page 4). Amended claim 36 recites, "The method of claim 29 wherein said SOI substrate is fabricated from a donor silicon wafer." This claim language finds support in the specification, for example, at page 4, lines 13-30. The Applicants believe this amended claim to be in condition for allowance.

Claim Rejections - 35 USC § 103

Claims 29 and 31-38 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,251,754 to Ohshima et al. (hereafter Ohshima) in view of U.S. Patent 5,141,878 to Benton et al. (hereafter Benton) and an article by Moriceau et al. "Hydrogen annealing treatment used to obtain high quality SOI surfaces" (hereafter Moriceau).

Amended claim 29 recites, in part, "contacting said cleaved surface with a hydrogen bearing environment at least when said temperature of said environment is

about 1000° Celsius and greater to reduce said first surface roughness value by at least about eighty percent to a second surface roughness value, said hydrogen bearing environment including at least an HCl gas and a hydrogen gas."

Ohshima discloses a method of manufacturing semiconductor substrates in which a high-temperature annealing step **P15** is carried out after an SOI substrate is detached from a base substrate (Ohshima at column 11, lines 36-56 and Figures 3 and 4D). As shown in Figure 4D, the defective layer **18** is characterized by a <u>rough surface</u>. The high-temperature anneal appears to cause "recovery of the defective layer at the detachment face, strengthening of the direct bonding, removal of surface oxides and <u>flattening accompanying silicon flow</u>." (Ohshima at column 11, line 55).

Benton discloses the design of an integrated photodiode for silicon monolithic integrated circuits and a method for making the same. (Benton at column 1, lines 1-10). Figure 2 of Benton shows schematically, the etching of a deep tub **13**. "The result of the tub-forming step is schematically illustrated in FIG. 2A which shows in schematic cross section, the substrate **10**, an epitaxial layer **11**, the oxide outer layer **12** and tub **13** with <u>smooth side walls</u> **14A** and **14B** <u>and bottom wall</u> **14C**." (Benton at column 2, lines 31-35). Prior to the epitaxial growth of a p-n junction in the deep tub, a five minute "high temperature pre-bake and <u>HCl-H_2 gas etch</u>" is performed "to reduce native oxide films and to <u>further</u> smooth the bottom and side walls of the tub." (Benton at column 2, lines 49-51).

The examiner states that it "would be obvious for one of ordinary skill in the art, at the time of the invention, to use the roughness-reducing, HCl-H_2 etchant anneal of Benton as the high temperature anneal of Ohshima, because Ohshima desires a native-oxide-removing, surface-flattening anneal to prepare the cleaved silicon surface for growth of an epitaxial layer." (Office Action at page 5). The Applicants respectfully traverse this argument.

The annealing steps of Ohshima and Benton differ in that Ohshima performs an annealing step involving silicon flow on a rough surface as pictured in Fig. 4D, while Benton performs a five minute pre-bake and etch process on a surface that is already smooth. Benton does not teach or suggest that the HCl-H_2 pre-bake and etch process is applicable to a rough surface or causes silicon flow as disclosed by Ohshima. On the contrary, Benton describes her process as an "etch" process. Furthermore, the other reference cited by the examiner does not remedy this deficiency.

The third piece of prior art cited by the examiner was the article by Moriceau in which a hydrogen annealing treatment is used on SOI surfaces. The examiner contends that Moriceau provides the degree of surface roughness reduction not indicated in Ohshima. (Office Action at page 5). The Applicants respectfully traverse the combination of Moriceau with Ohshima for at least the following reasons.

The Applicants respectfully submit that Moriceau only discloses the use of a hydrogen annealing environment and therefore does not teach or suggest the use of a "hydrogen bearing environment including at least an HCl gas and a hydrogen gas" as recited, in part, in amended claim 29. The hydrogen annealing environment disclosed by Moriceau is fundamentally different from the environment of the present embodiment.

Additionally, the results produced by Moriceau's method differ significantly from those of the present embodiment. Although the examiner correctly noted that the reduction in surface roughness shown in Figure 1 of Moriceau bears a relation to the method of the present embodiment, in which the surface is substantially planarized, other results are markedly divergent. Moriceau discloses that the hydrogen anneal produces 1) a thinning of the superficial silicon layer, 2) the production of "long and narrow crystalline terraces," and 3) the production of "a lot of small pits." (Moriceau at page 37). These divergent results support the Applicants' contention that the method disclosed by Moriceau does not serve as a useful point of comparison to that of the present embodiment. Based on at least these reasons, the Applicants respectfully submit

that there is no motivation to consider the results produced by the hydrogen annealing process disclosed by Moriceau as relevant to the present embodiment.

Claim 30-39, which depend on claim 29 are believed to be in condition for allowance for at least these reasons, and others.

Claim 30

Claim 30 was rejected under 35 U.S.C. 103(a) as being unpatentable over Ohshima in view of Benton and Moriceau and in further view of an article by Tate et al., "Defect reduction of bonded SOI wafers by post anneal process in H_2 ambient." Claim 30 recites, in part, "increasing the temperature [ ] at a rate of about 10 Degrees Celsius per second and greater."

Although Tate discloses the use of a rapid thermal anneal (RTA) process to perform defect reduction, Tate does not teach or suggest the use of a H_2 anneal "to reduce said first surface roughness value" as recited, in part, in amended claim 29, on which claim 30 depends. Tate does not teach or suggest that there is a correlation between defect reduction and surface smoothness.

Claim 39

Claim 39 was rejected under 35 U.S.C. 103(a) as being unpatentable over Ohshima in view of Benton and Moriceau and in further view of U.S. Patent 6,355,269 to Sato. The Applicants respectfully traverse the use of Sato as prior art.

Sato does not serve as prior art since the Applicant's priority date of April 21, 1999 precedes both the U.S. filing date of September 3, 1999 and the publication date of January 1, 2002 for U.S. patent 6,335,269 to Sato.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance and an action to that end is urged. If the

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Examiner believes a telephone conference would aid in the prosecution of this case in any way, please call the undersigned at 650-326-2400.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claims 29, 32-34, 36, 37, and 39 have been amended as follows:

29. (Amended) A dry method for finishing SOI substrates, said method comprising:

providing an SOI substrate comprising a cleaved surface, said cleaved surface having a first surface roughness value;

increasing a temperature of an environment associated with said cleaved surface to about 1,000° Celsius and greater; and

contacting said cleaved surface with a hydrogen bearing environment at least when said temperature of said environment is about 1000° Celsius and greater to reduce said first surface roughness value by at least about eighty percent to a second surface roughness value, said hydrogen bearing environment including at least an **[HCL]** HCl gas and a hydrogen gas;

whereupon the cleaved surface having the second roughness value is substantially planarized.

32. (Amended) The method of claim 29 wherein said HCl gas and said hydrogen gas are a ratio **[(HCl:H2)]** ($HCl:H_2$) of about 0.001 to 30.

33. (Amended) The method of claim 29, wherein said hydrogen gas and the HCl gas interact with said cleaved surface to reduce said surface roughness value.

34. (Amended) The method of claim 29 wherein said first surface roughness value of said cleaved surface is reduced in a thermal processing chamber.

36. (Amended) The method of claim 29 wherein said SOI substrate is fabricated from a donor silicon wafer.

37. (Amended) The method of claim 29 wherein **[said environment is]** said surface is raised to a temperature of at least about 1,000° Celsius.

39. (Amended) The method of claim 29 wherein the environment is maintained at a pressure of about 1 **[atomsphere]** atmosphere.